FIG. 1

FIG. 2A

86

118

120

110
112
116

114

RESERVOIR 80

REAR PRESSURE CHAMBER 30

[IN OFF STATE]

FIG. 2B

86

118

120

F1

110

116

112 F2

F3

114

[IN ON STATE]

PRESSURE-HOLDING VALVES — 54

PRESSURE-REDUCING VALVES — 58

PUMP MOTOR — 70

PUMP MOTOR — 84

LINEAR VALVE — 86

ELECTROMAGNETIC SHUT-OFF VALVE — 88

ELECTROMAGNETIC SHUT-OFF VALVE — 90

ELECTROMAGNETIC SHUT-OFF VALVE — 92

DRIVER CIRCUITS — 180
DRIVER CIRCUITS — 180
DRIVER CIRCUITS — 180
DRIVER CIRCUITS — 180
DRIVER CIRCUITS — 180
DRIVER CIRCUITS — 180
DRIVER CIRCUITS — 180
DRIVER CIRCUITS — 180

150

152

ROM — 156
CPU — 154
RAM — 158

160

INPUT-OUTPUT PORTION

OPERATING FORCE SENSOR — 166

REAR-CHAMBER PRESSURE SENSOR — 164

MASTER-CYLINDER PRESSURE SENSOR — 162

WHEEL SPEED SENSORS — 168

FIG. 3

FIG. 4

SWITCHING POINT

$P_{max} \cdot \dfrac{A_{m3}}{A_{m1}} + \dfrac{F_p \times R_p}{A_{m1}}$

P_1

$P_{max} \times \dfrac{A_{m3}}{A_{m1}}$

$P_3 \times \dfrac{A_{m3}}{A_{m1}}$

$F_p \times \dfrac{R_p}{A_{m1}}$

F_p

$\dfrac{P_{max} \times A_{m3}}{R_p(R_s - 1)}$

CONSTANT SERVO RATIO R_S

$R_S = \dfrac{P_1 \times A_{m1}}{F_p \times R_p}$

R_P: LEVER RATIO

FIG. 5

$P_1 \times A_{m1} = P_3 \times A_{m3} + F_p \times R_p \quad \cdots (1)$

FIG. 6

FIG. 7

FIG. 8

$$\frac{dP_{WC}}{dt}$$

P_{WC}

FIG. 9

```
        ┌──────────────────────┐
        │   PRESSURE CONTROL   │
        └──────────────────────┘
                   │
        S1         ▼
              ◇ P₁≧P_IS ◇ ──── YES ──────────────────┐
              ◇    ?    ◇                             │
                   │ NO                               │
                   ▼                                  ▼
   S2 ┌──────────────────────┐     S5 ┌──────────────────────┐
      │ CLOSING SHUT-OFF     │        │ OPENING SHUT-OFF     │
      │ VALVE 92,            │        │ VALVES 92,           │
      │ AND OPENING SHUT-OFF │        │ 88, AND CLOSING      │
      │ VALVES 88 AND 90     │        │ SHUT-OFF VALVE 90    │
      └──────────────────────┘        └──────────────────────┘
                   │                             │
                   ▼                             ▼
   S3 ┌──────────────────────┐     S6 ┌──────────────────────┐
      │ DETECTING OPERATING  │        │ DETECTING OPERATING  │
      │ STROKE Fp            │        │ FORCE Fp             │
      └──────────────────────┘        └──────────────────────┘
                   │                             │
                   ▼                             ▼
   S4 ┌──────────────────────┐     S7 ┌──────────────────────┐
      │ DETERMINING ELECTRIC │        │ DETERMINING ELECTRIC │
      │ CURRENT I APPLIED TO │        │ CURRENT I APPLIED TO │
      │ LINEAR VALVE 86      │        │ LINEAR VALVE 86      │
      └──────────────────────┘        └──────────────────────┘
                   │                             │
                   ◄─────────────────────────────┘
                   ▼
        ┌──────────────────────┐
        │       RETURN         │
        └──────────────────────┘
```

$P_1 \geqq P_{IS}$?
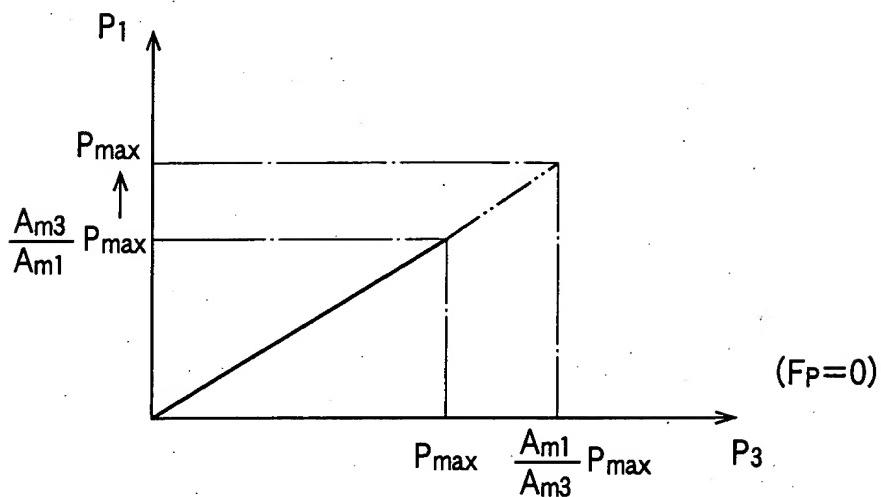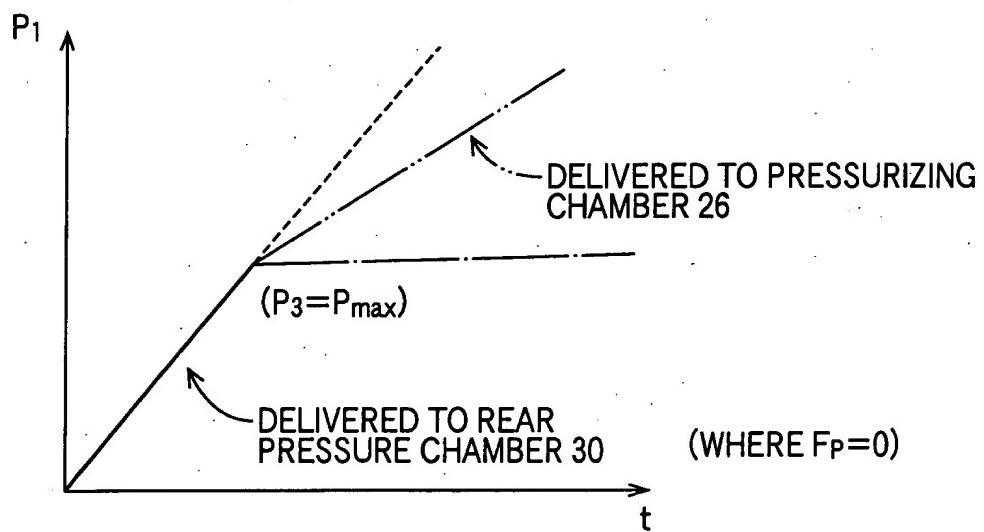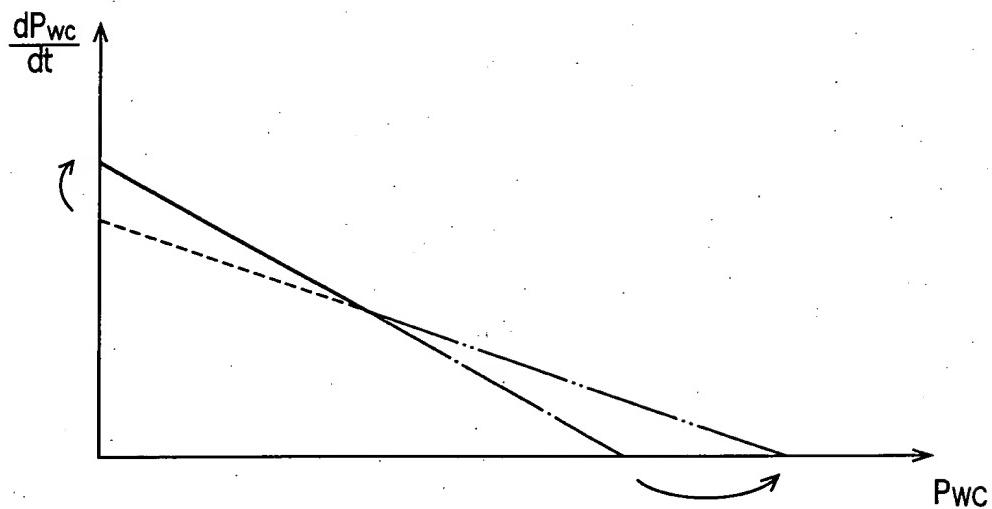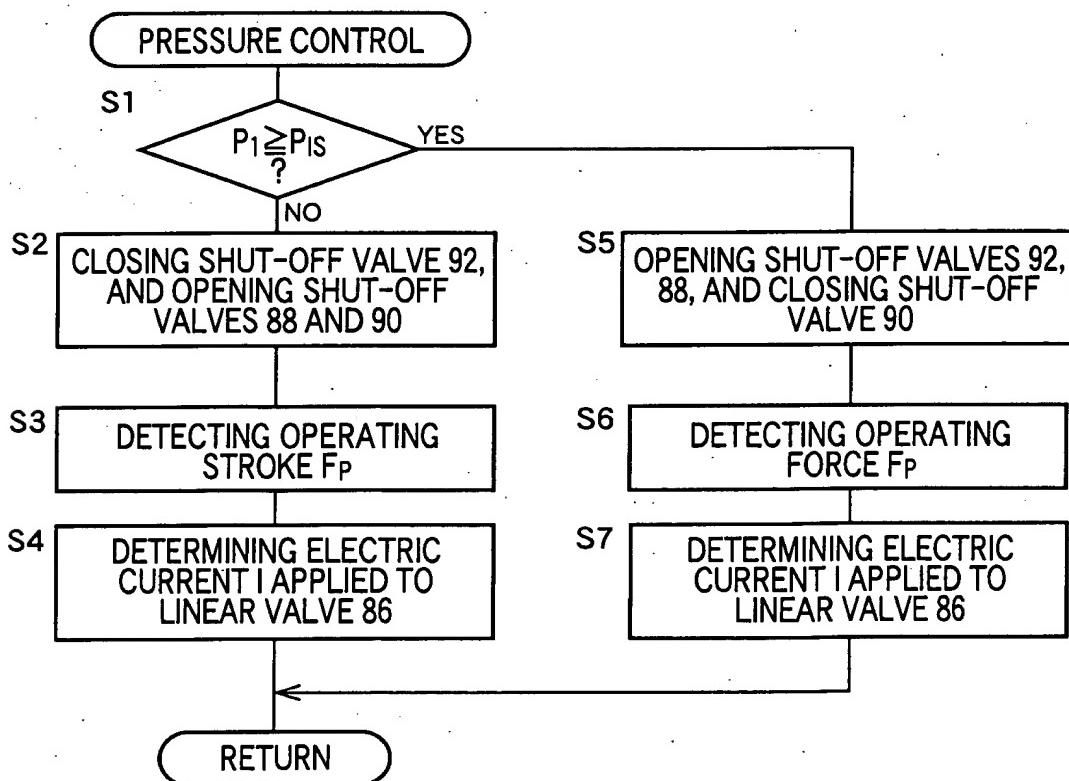
FIG. 10

	FIRST STATE	SECOND STATE
SHUT-OFF VALVE 88	OPEN	OPEN
SHUT-OFF VALVE 90	OPEN	CLOSED
SHUT-OFF VALVE 92	CLOSED	OPEN
RATE OF FLOW q_{WC} INTO BRAKE CYLINDER	$(A_{m1}/A_{m3})\, q$	q
BRAKING PRESSURE P_{WC}	$(A_{m3}/A_{m1})\, P$ (FP = 0)	P

FIG. 11

SWITCHING
PRESSURE
P_{IS}

SWITCHING
RATIO
$\dfrac{\Delta P_I}{\Delta F_P}$

MOTOR VOLTAGE

FIG. 12

SWITCHING PRESSURE P_{IS} (vertical axis)

FLUID TEMPERATURE (horizontal axis)

FIG. 13

SWITCHING RATIO $\dfrac{\Delta P_I}{\Delta F_P}$ (vertical axis)

FLUID TEMPERATURE (horizontal axis)
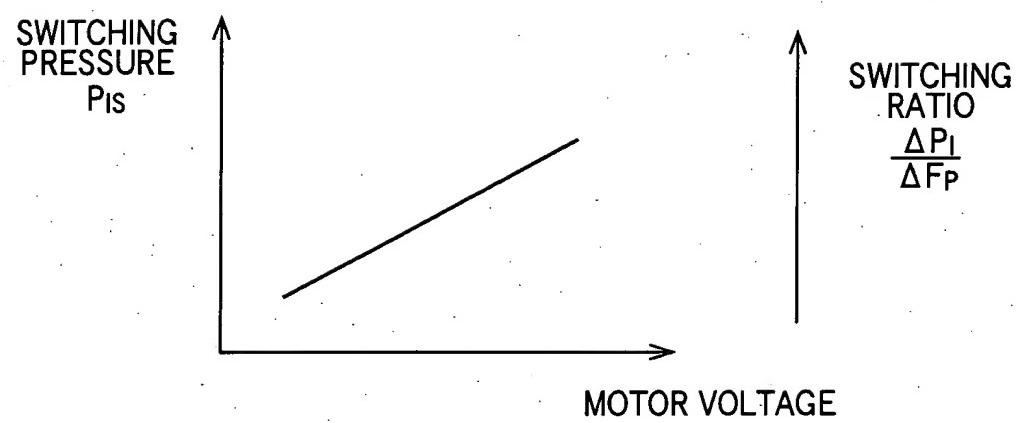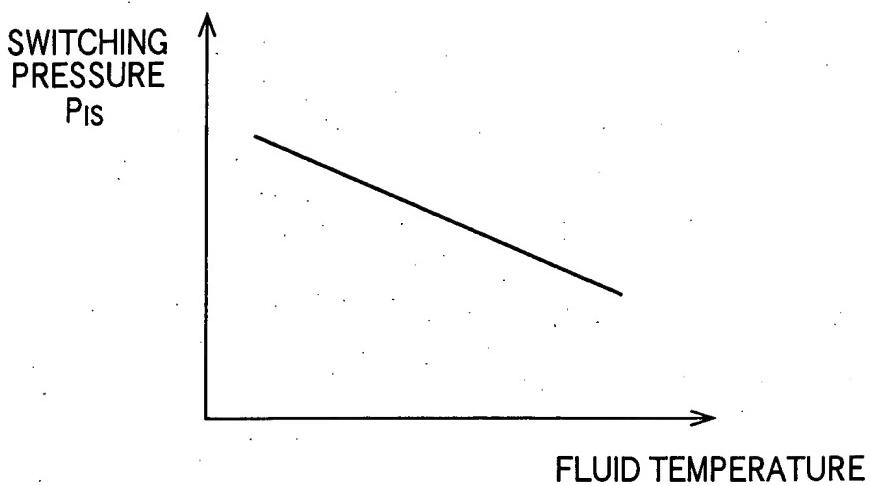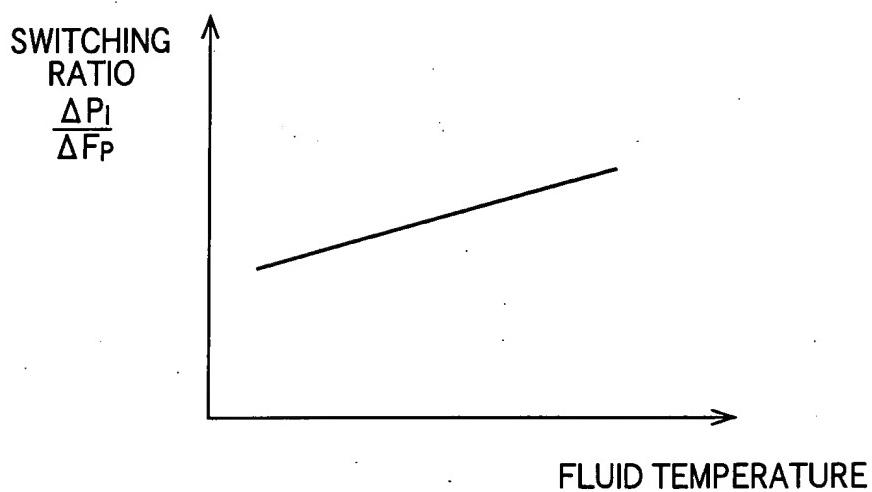
FIG. 14
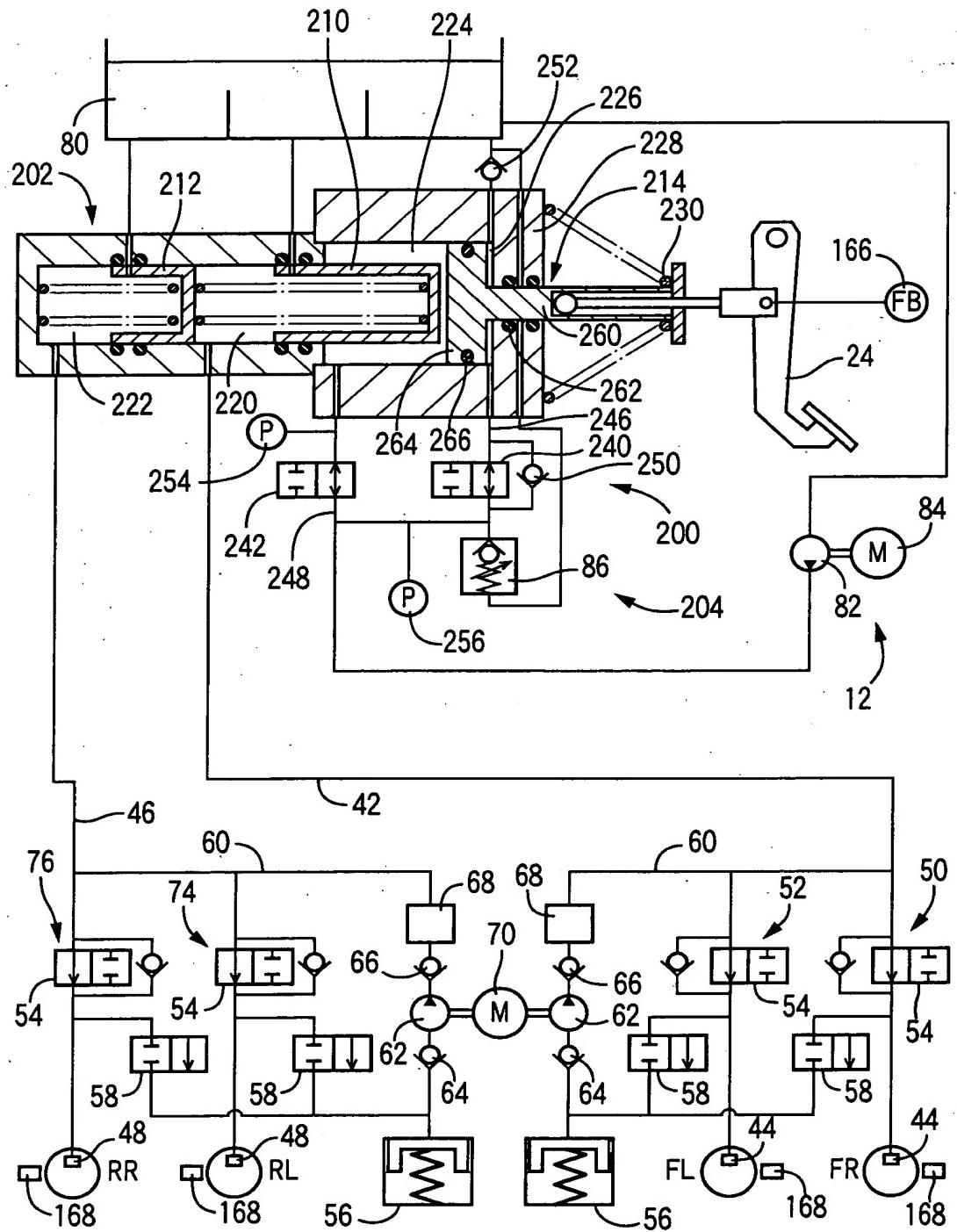
FIG. 15
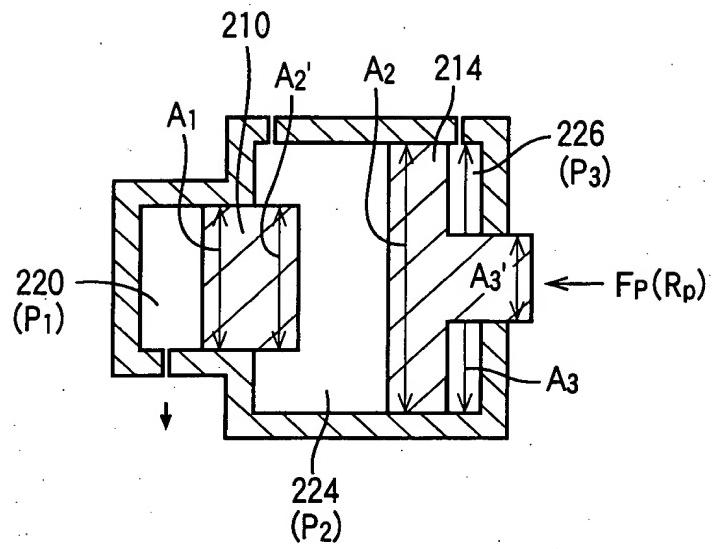
FIG. 16

	FIRST STATE	SECOND STATE
SHUT-OFF VALVE 240	OPEN	CLOSED
SHUT-OFF VALVE 242	CLOSED	OPEN
RATE OF FLOW q_{WC} INTO BRAKE CYLINDER	$(A_2/A_3) \cdot q \cdot (A_2 A_1/A_3 A_2') \cdot q$	$q \cdot (A_1/A_2') \cdot q$
BRAKING PRESSURE P_{WC}	$(A_3/A_2) \cdot P \cdot (A_3 A_2'/A_2 A_1) \cdot q$ $(FP = 0)$	$P \cdot (A_2'/A_1) \cdot P$

FIG. 17

FIG. 18A

338

368

370

372

360

364

362 F₃

REAR PRESSURE CHAMBER 304
PRESSURIZING CHAMBER 318

[OFF]

FIG. 18B

338

368

370

372

360

362

364

← RESERVOIR

REAR PRESSURE CHAMBER 304
PRESSURIZING CHAMBER 318

[ON]
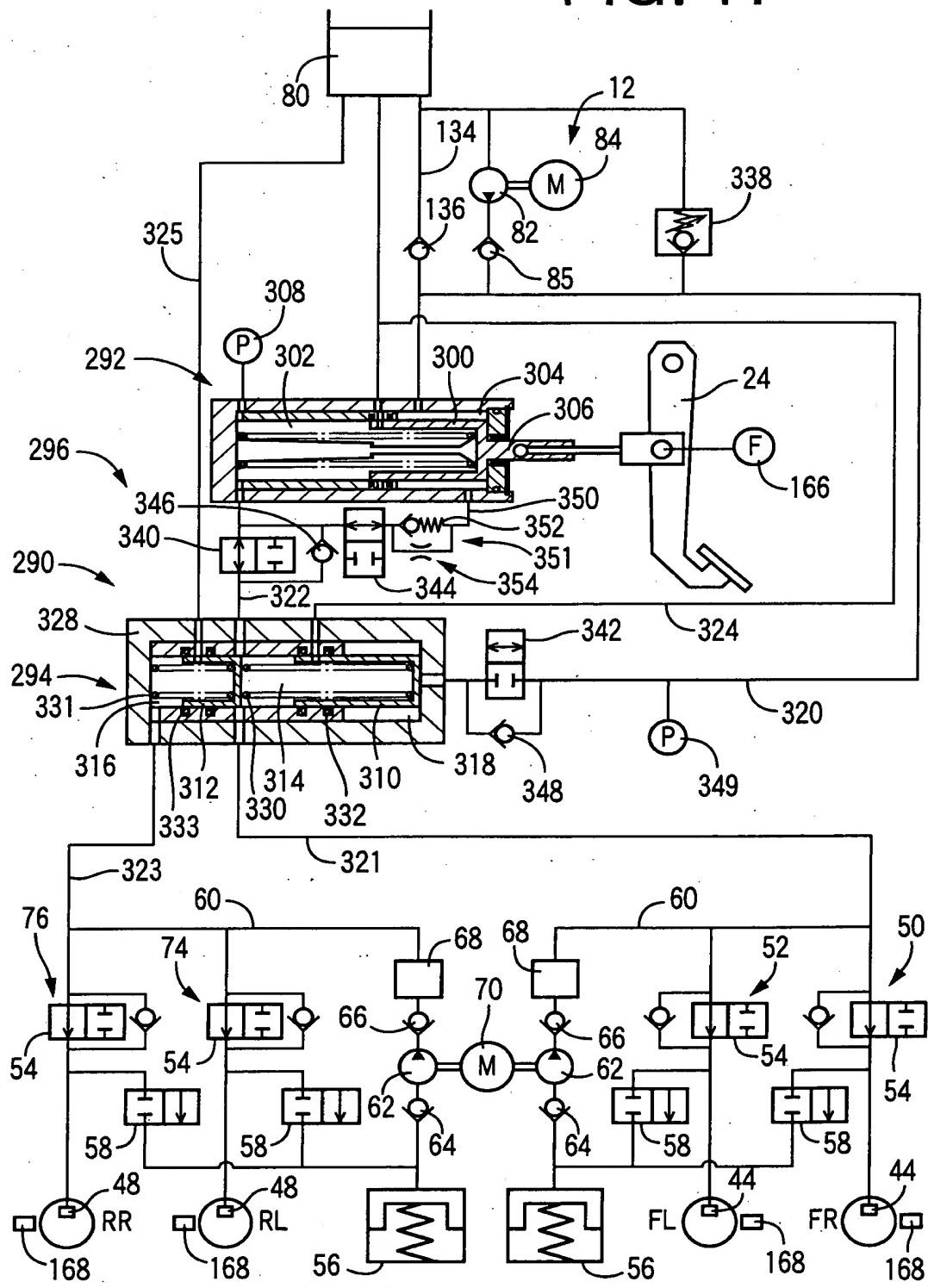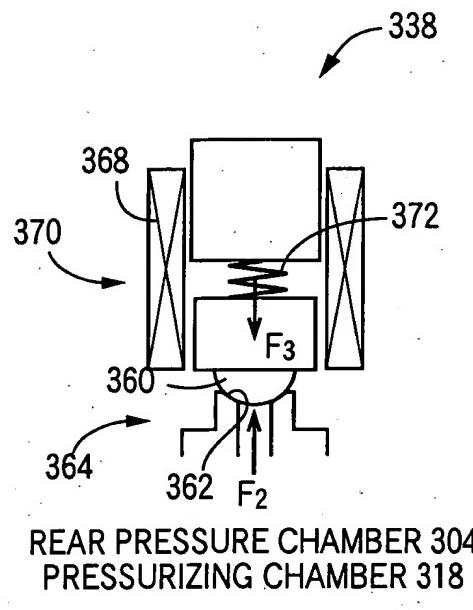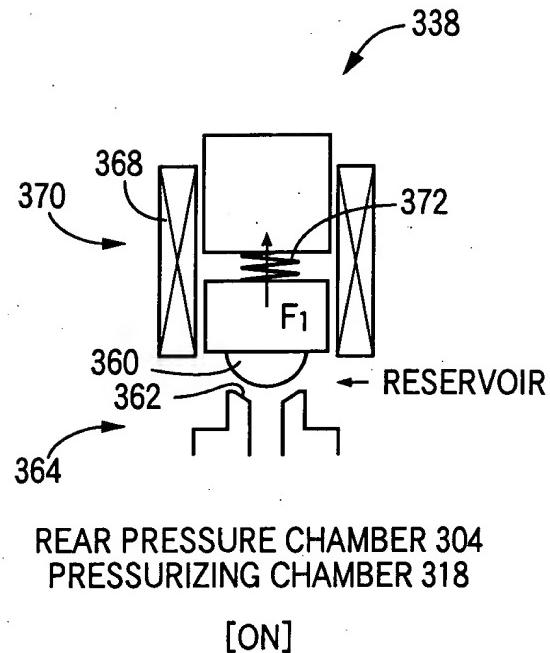
FIG. 19

	FIRST STATE	SECOND STATE
SHUT-OFF VALVE 340	OPEN	CLOSED
SHUT-OFF VALVE 342	CLOSED	OPEN
SHUT-OFF VALVE 344	CLOSED	CLOSED
RATE OF FLOW INTO BRAKE CYLINDER	$(A_{m1}/A_{m3}) \cdot q$	q
BRAKING PRESSURE	$(A_{m3}/A_{m1}) \cdot P$ (FP = 0)	P
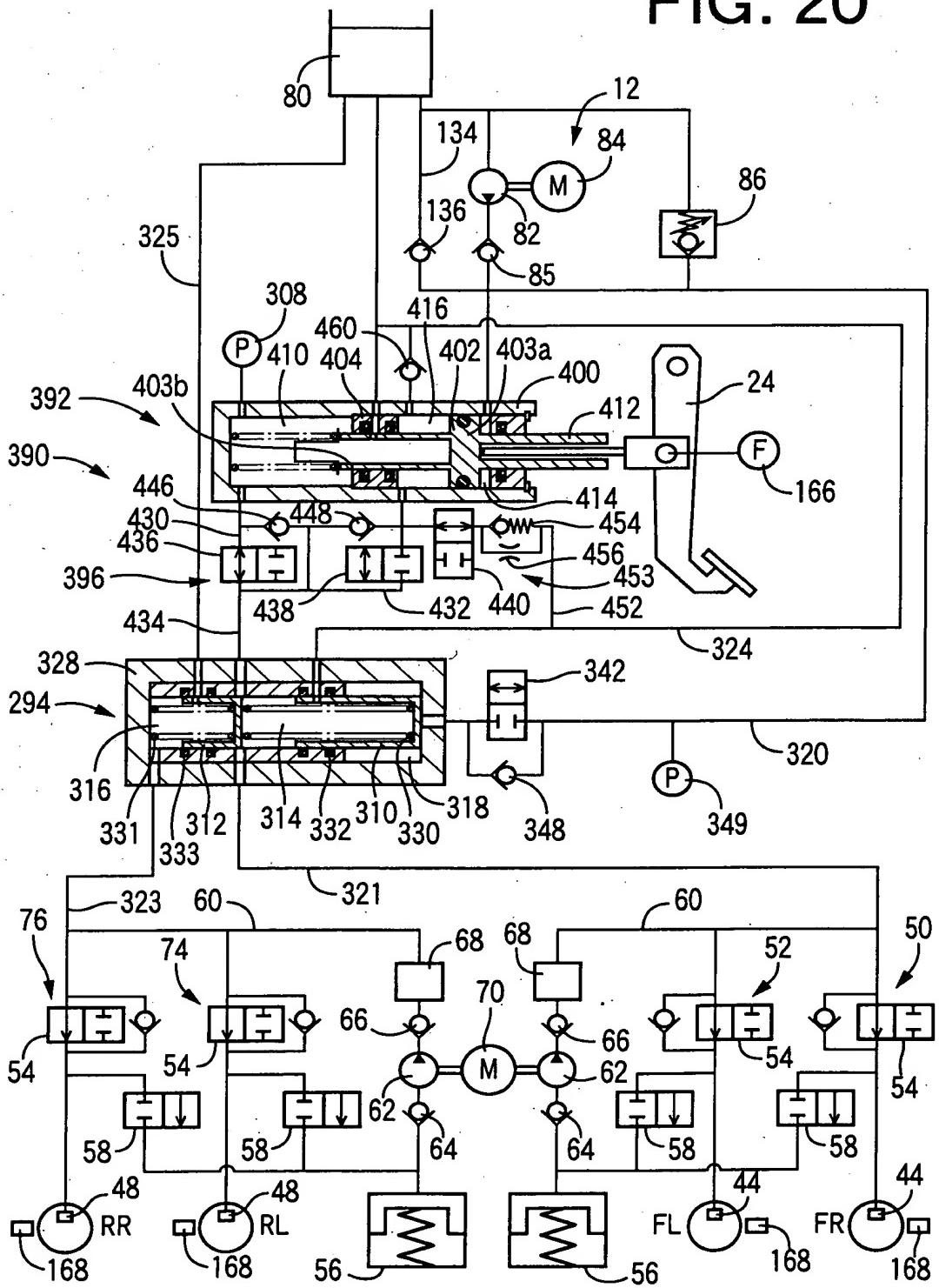
FIG. 20

FIG. 21
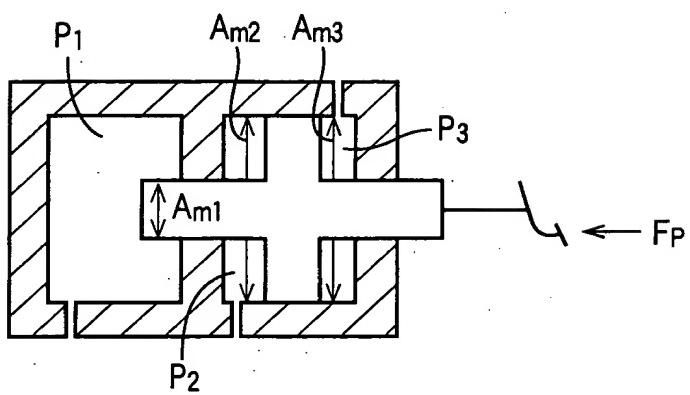
FIG. 22

	1st STATE	2ND STATE	3RD STATE
SHUT-OFF VALVE 436	OPEN	CLOSED	OPEN
SHUT-OFF VALVE 438	OPEN	CLOSED	CLOSED
SHUT-OFF VALVE 440	CLOSED	CLOSED	CLOSED
SHUT-OFF VALVE 342	CLOSED	OPEN	CLOSED
RATE OF FLOW INTO BRAKE CYLINDER	$\{(A_{m1} + A_{m2})/A_{m3}\} \cdot q$	q	$(A_{m1}/A_{m3}) \cdot q$
BRAKING PRESSURE	$(A_{m3} \cdot P)/(A_{m1} + A_{m2})$ (FP = 0)	p	$(A_{m3}/A_{m2} \cdot P)$ (FP = 0)

FIG. 23
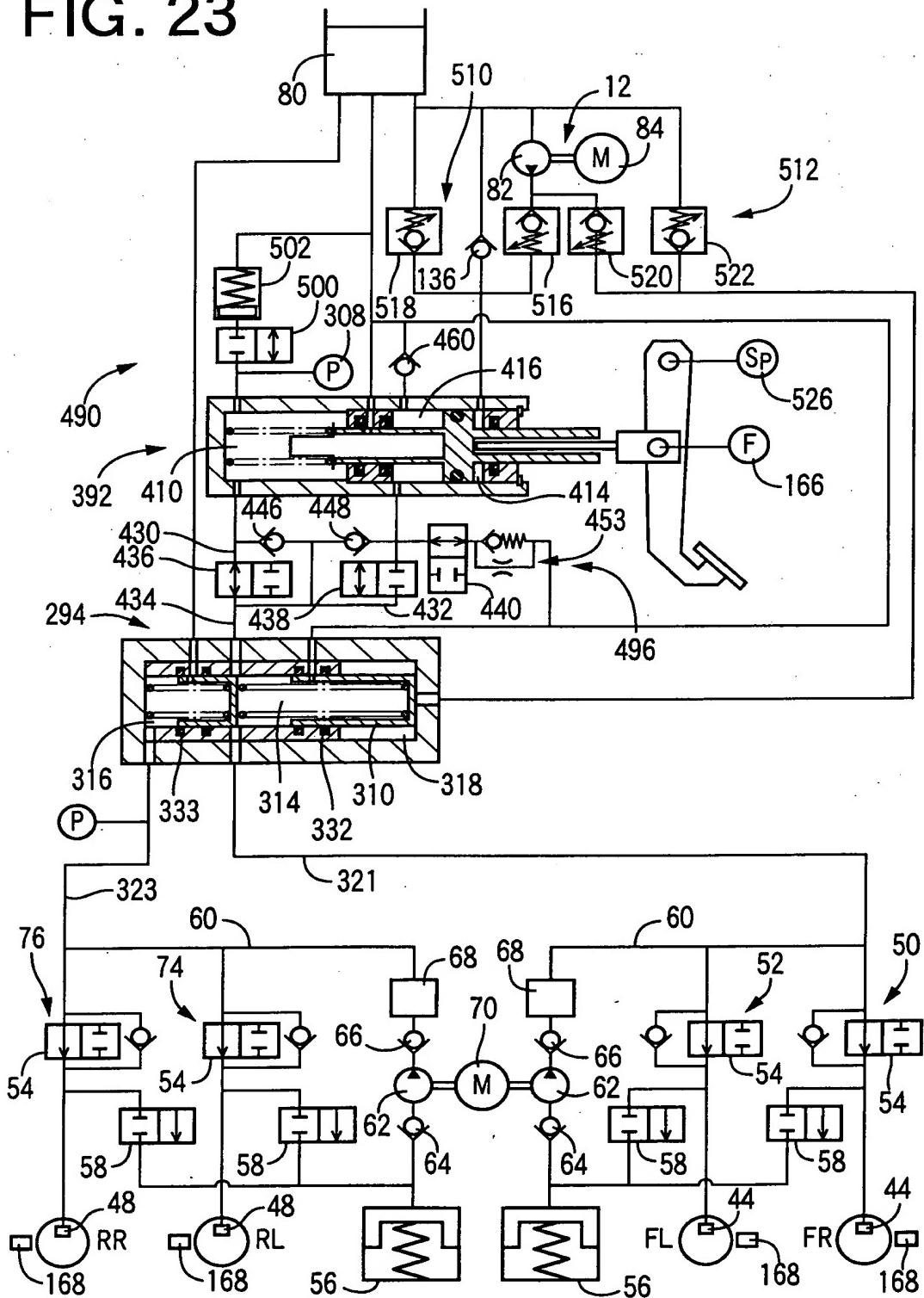
FIG. 24
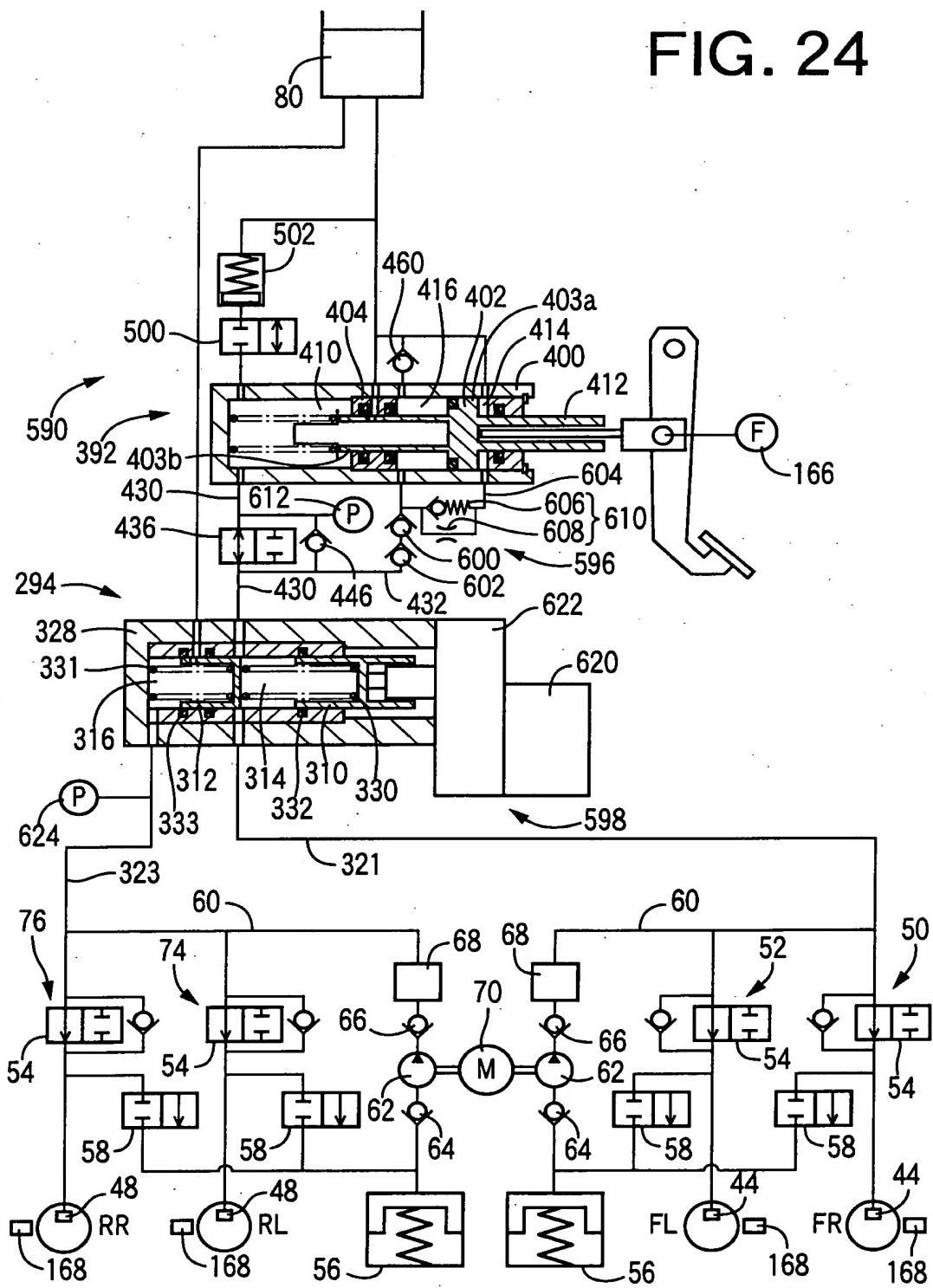
FIG. 25
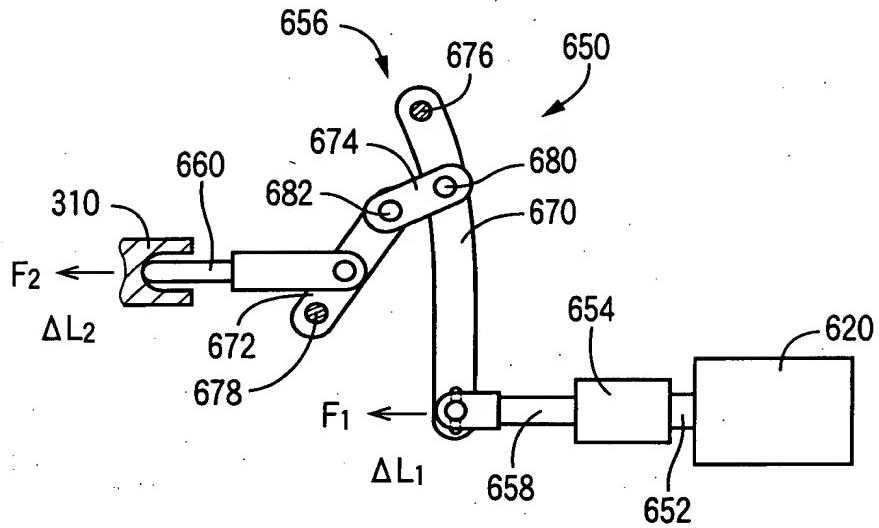
FIG. 26
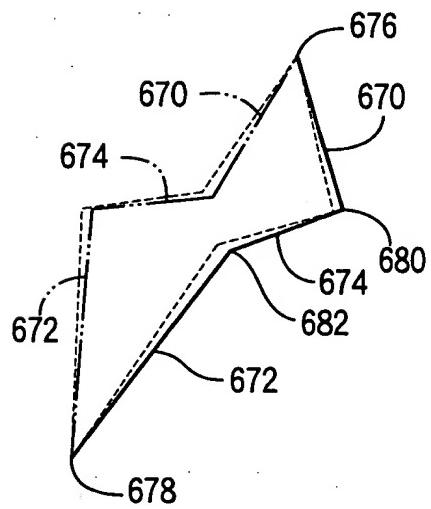
FIG. 27

FIG. 28

FIG. 29A

706

708

θ_2

θ_1

FIG. 29B

θ_2'

θ_1'

$$\frac{\theta_2'}{\theta_1'} < \frac{\theta_2}{\theta_1}$$
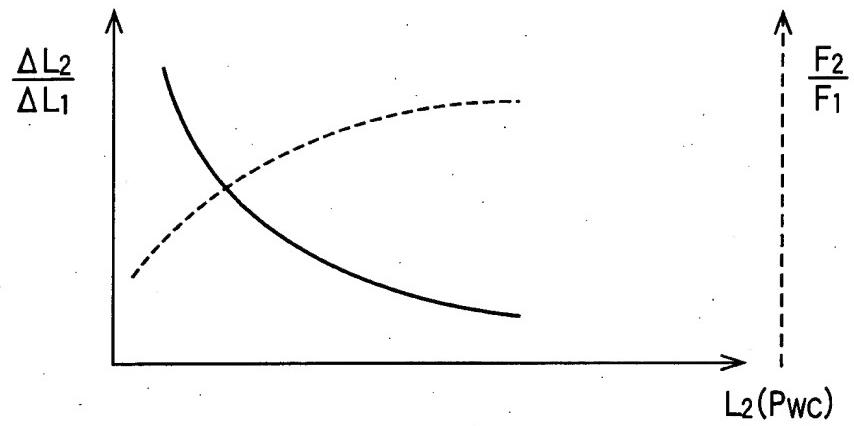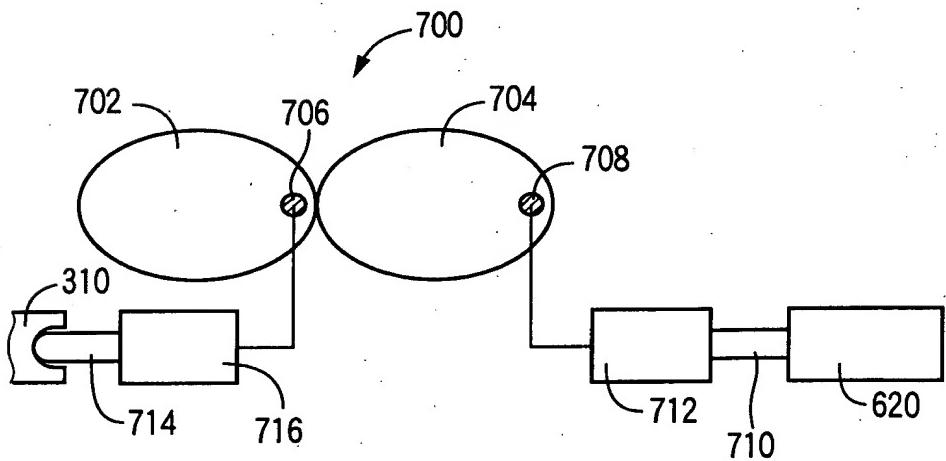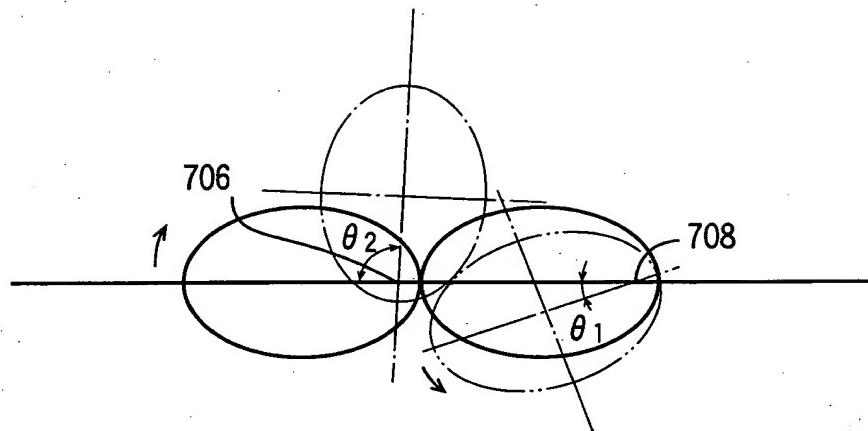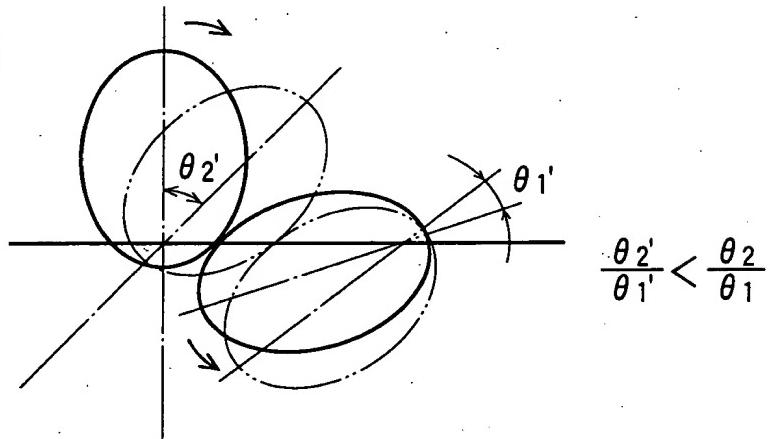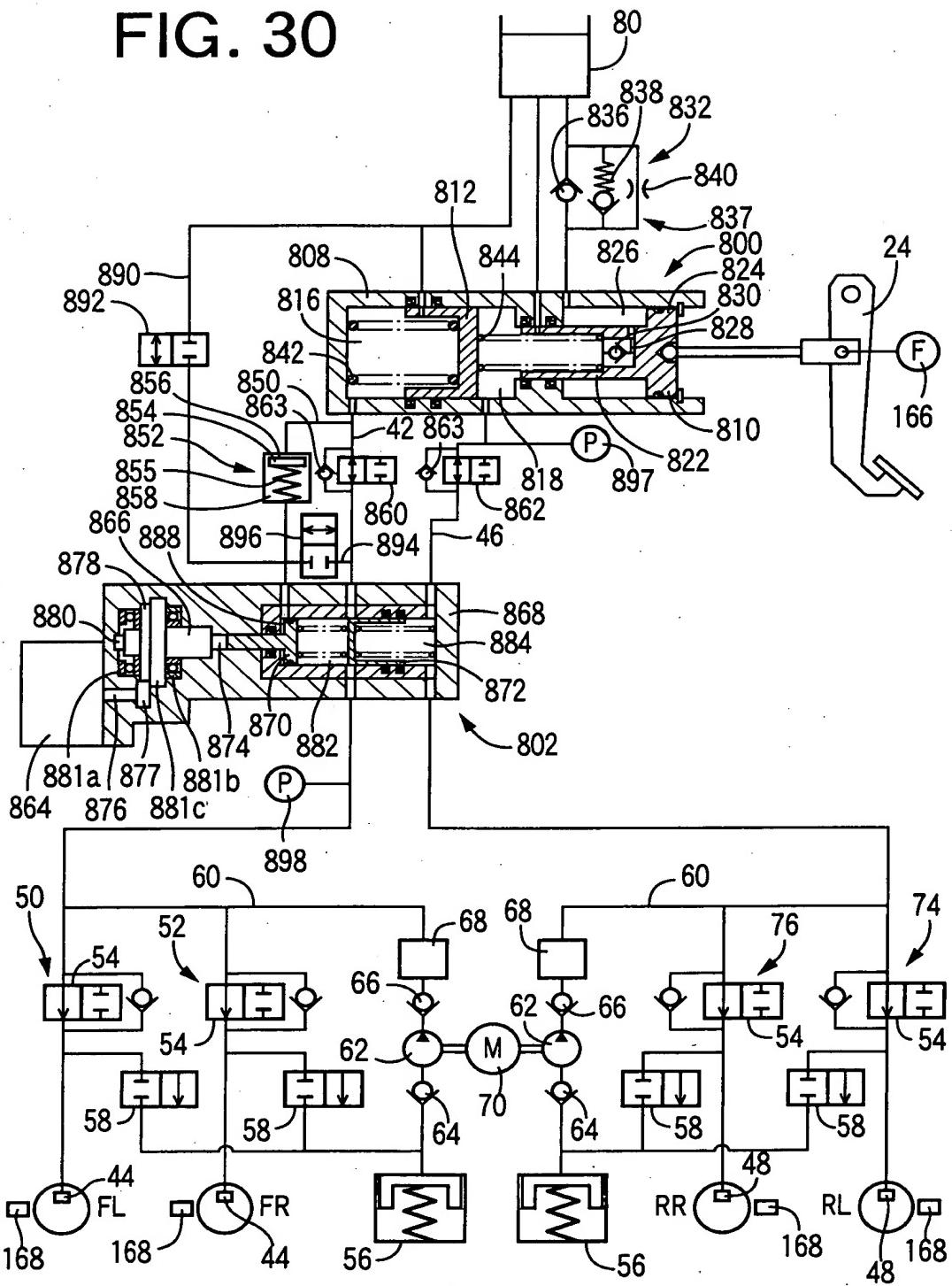
FIG. 30

FIG. 31

	FIRST STATE	SECOND STATE
SHUT-OFF VALVE 892	OPEN	CLOSED
SHUT-OFF VALVE 896	CLOSED	OPEN
RATE OF INCREASE OF BRAKING PRESSURE	$\Delta Fd/A_1$	$\Delta Fd/(A_1 \cdot A_3)$

FIG. 32
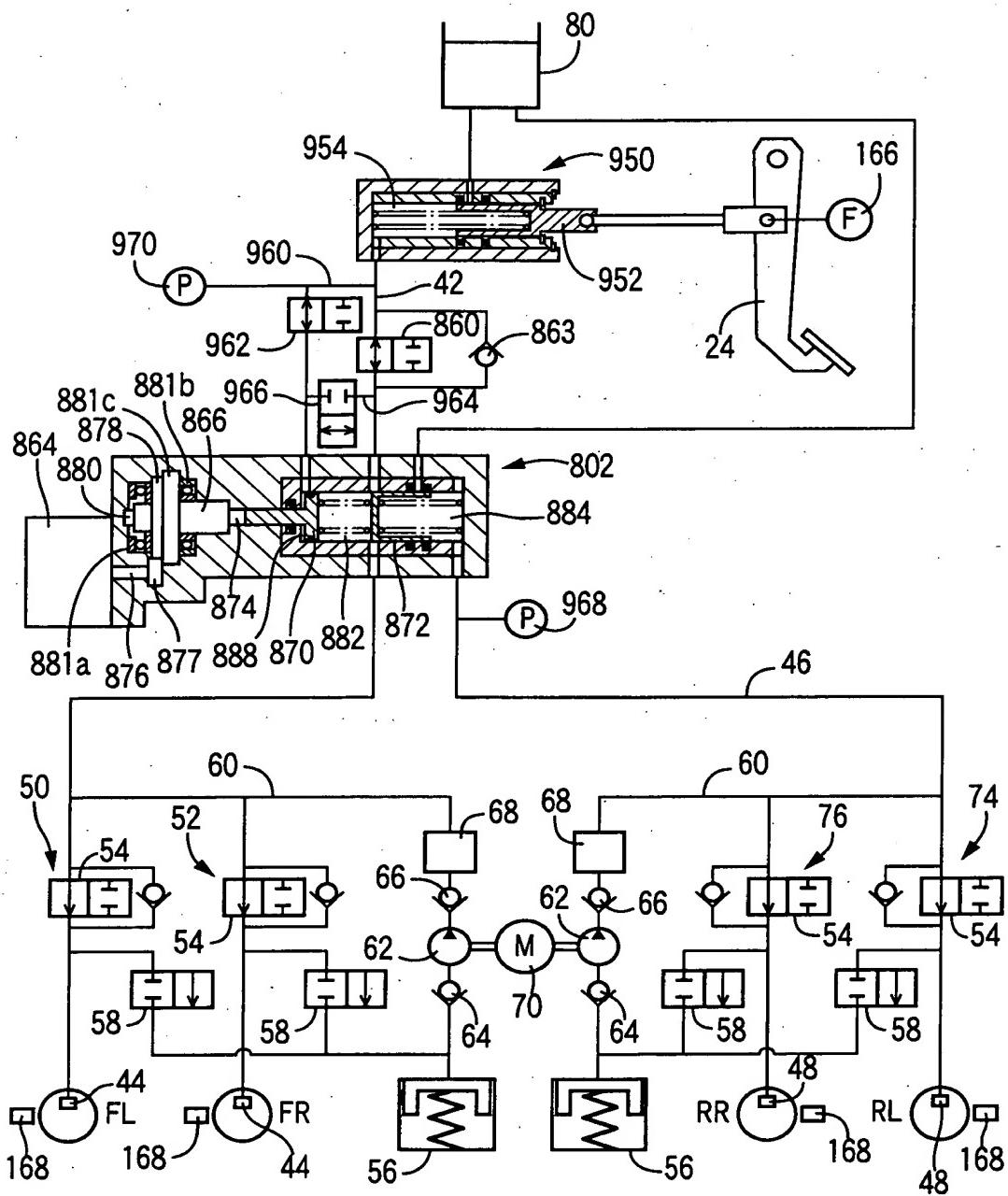
FIG. 33

	FIRST STATE	SECOND STATE
SHUT-OFF VALVE 962	OPEN	CLOSED
SHUT-OFF VALVE 966	CLOSED	OPEN
PRESSURE INCREASE RATE BOOSTING RATIO	$\Delta Fd \cdot \gamma / (A_1 \cdot \gamma - A_3)$	$\Delta Fd / (A_1 - A_3)$